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A COMPILATION OF METHODOLOGICAL PROBLEMS CONFRONTING THE AIR FORCE ETC(U)
1977 H R BLOCH, J W MARLIN, P R WIEST AF-AFOSR-3168-77

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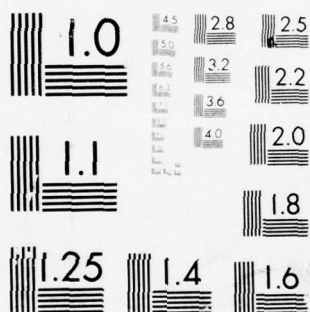
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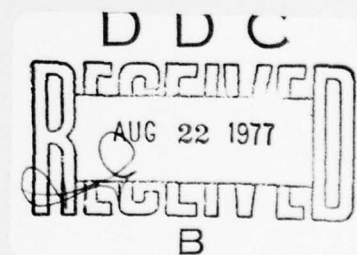


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**ECONOMIC
BASIC RESEARCH
PROBLEMS**



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RESEARCH REPORT

A COMPILATION OF
METHODOLOGICAL PROBLEMS
CONFRONTING THE AIR FORCE IN
THE FIELDS OF ECONOMICS AND MANAGEMENT
Phase I

Submitted to
The Air Force Office of Scientific Research

by
The Center for Economic Analysis

AFOSR Grant 77-3168

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SUMMARY

Investigators from the Center for Economic Analysis conducted interviews with Air Force decision makers and analysts of all ranks and from all levels of organization. The purpose of the interviews was to ascertain the basic research needs of the Air Force in the fields of economics and management. Over one hundred separate research requirements were identified and are included as Appendix B.

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The United States Air Force is one of the largest "businesses" in the world, involving the expenditures of billions of dollars and employing hundreds of thousands of men and women. Yet traditional measures of management effectiveness and techniques used in the private sector are not necessarily applicable to the Air Force since the ultimate "product" of the Air Force, national defense, has no real price tag. The American people credit the military with complete success only when there is peace and the military remains unused.

The maintenance of peace in the world today is an expensive undertaking and becoming more so. The requirement which the Air Force must meet in order to achieve its mission has become increasingly complex. At the same time, other social needs of the American people have received increased emphasis thus severely limiting funds available to the military. The net result is that the Air Force is called upon to accomplish more and more with less and less. The only way in which this can be done is through greater efficiency in the utilization of the Air Force's limited resources. This study is aimed at determining ways to increase that efficiency.

This research report covers the first phase of a three phase effort undertaken by the Center for Economic Analysis (CEA), Fairfax, Virginia. The goal of the whole project is to provide to the Air Force Office of Scientific Research (AFOSR) a prioritized compilation of researchable problems in the areas of economics and management. The first phase identifies problem areas, the second defines and limits the problems, and the third presents the material for the guidance of the American research community.

Methodology

The working premise established by CEA for phase I is that only Air Force managers and decision makers could actually identify meaningful problems. The findings of this study, therefore, are the result of extensive interviews with Air Force military and civilian personnel. Over 75 key leaders were personally contacted and interviewed in depth. A list of the interviewees is given in Appendix A. The people who were interviewed ranged in rank from Sergeant through Major General and were assigned from the lowest level in the field through Major Air Command to Headquarters, USAF. Within the Headquarters, the staffs of every major Deputate and Assistant Chief of Staff were canvassed. Special attention was given to the major non-combat commands: Air Force Systems Command, Air Force Logistics Command, and Air Training Command. In sum, the interviews conducted were both wide ranging and exhaustive.

Very few of the interviewees were trained in economics. Therefore, it was necessary for CEA investigators to provide considerable assistance to the individuals interviewed in order to isolate those management problems which remained unsolved due to lack of the basic knowledge, techniques, or methodology to solve the problem. Many problems of management were identified which could be solved by using existing methods. These problems are not included in this report. (In these instances the CEA investigators were often able to offer on-the-spot advice on how to obtain the necessary information.) This report, therefore, is a compilation only of problem areas that are amenable to basic research.

Findings

Over 100 individual problem areas were identified. A detailed listing is included as Appendix B. The format chosen for presenting the problems was to group them into categories. These categories are not necessarily arranged along Air Force organizational lines. Very early in the investigation it became apparent that many methodological problems were shared by managers in all functional areas.* Since the ultimate product of the investigation would be a guide for researchers rather than managers, it was decided to organize the report for the benefit of future researchers.

The gaps in knowledge which were most often mentioned were: in measuring output so as to determine effectiveness of programs, in measuring costs, in determining the most effective management techniques and motivations, in determining proper variables on which to make projections, and in selecting criteria by which to judge programs. As can be seen, these problems transcend Air Force organization.

The CEA investigators are convinced that the research community can provide answers to a number of the questions posed. As is usually the case, the biggest problem is defining the problem. This report can materially assist in that determination.

Future Research

As was previously mentioned, this report covers only one phase of a three phase program. Without the second two phases the research is

*For instance, in almost every functional area, from logistics to personnel, the problem of output measurement seemed to be of paramount importance. This is not at all surprising since this is one of the major problems with any government activity which operates outside the market system.

incomplete. It will be necessary to define more sharply each problem to be researched. Priorities need to be assigned to projects. The CEA proposes that the best way to do this is through a conference convened specifically for that purpose. Attendees at the conference should be:

(1) Air Force representatives from the major functional areas covered during the interviews and (2) a representative sampling from the research community, both contract researchers and academics. At this conference Air Force managers, (with the assistance of CEA) will present their problems and indicate the possible benefits of solving the problems. The research community can then assess the feasibility of performing the research and limit the boundaries of each problem. Together the two groups should then determine the priorities for research.

In Phase III, CEA will prepare a comprehensive report summarizing the results of the conference. This report should be adopted as the officially endorsed AFOSR basic research program in the area of management and economics. The report should receive wide dissemination throughout the research community and serve as the basis for future research proposals.

Little good can come from a program which enumerates problems unless funding is available for meeting the identified research needs. CEA recommends that AFOSR seriously consider a reassessment of internal budget priorities in order to include substantial funding for economic research within the overall AFOSR program. The CEA investigators have become convinced through this investigation that there is an overriding need for such a program. One of the most often heard comments from Air Force leaders was to the effect, "Thank goodness someone is finally investigating this area. Where have you been until now?" In terms of ultimate payoff for the Air

Force and the American taxpayer, we can think of few investments which promise such a high return.

The Center for Economic Research

Principal Investigator: Dr. Howard R. Bloch

Associate Investigator: Dr. James W. Marlin, Jr.

Associate Investigator: Dr. Philip R. Wiest

Associate Investigator: Dr. William P. Snavely

APPENDIX A

Interviews

Interviews

Headquarters, United States Air Force

Comptroller

ACM Col Olver -- Analysis
Dr. Ellis -- Economist
Mr. Arnold -- Economic Analysis

ACB B/Gen Lynch -- Deputy Comptroller
Mr. Popple -- Director of Budget

ACA Lt Col Mikus -- Accounting and Finance
Mr. Fong -- Accounting and Finance

ACS/ Studies and Analysis

Col Burch -- Special Assistant to ACS/SA
Capt Clavenna -- General Purpose Forces, Cost Analysis

ACS/Intelligence

Mr. Pafenberg -- Special Advisor to ACS/I
Capt McLaughlin -- Economic Advisor to ACS/I

DCS/Systems and Logistics

LG Col Shelton -- Executive to DCS

LGP M/Gen Lowe -- Director, Procurement
L/Col Strayer -- Business Research Management Center
(Wright Patterson AFB, OH)

LGY M/Gen Nelson -- Director, Maintenance & Supply
B/Gen O'Loughlin -- Deputy Director
Col Yunk -- Logistics Engineering
Lt Col Clanton -- Logistics Engineering

LGX Mr. Delvecchio -- Associate Director, Logistics Plans
Lt Col Frisbee -- Computer Applications

LGF Col Wittaker -- Foreign Military Sales

DCS/Research and Development

RDX Col Foley -- Planning, Programming, & Analysis
Lt Col Colwell -- Planning, Programming, & Analysis

RDP Lt Col Wilkenson -- Science and Technology

Headquarters, United States Air Force (Continued)

DCS/Personnel

DPX Col Milanovich -- Accessions Policy
Col Arcari -- Entitlements
Lt Col Walters -- Analysis
Lt Col Wilson -- Analysis
Capt Gaffney -- Analysis

DPP Col Hagenbrock -- Education
Col Hirsh -- Budget
Col Herring -- Training
Col Needham -- Flying Training
Maj Aultman -- Technical Training
Mr. Moy -- Training Devices

DPM (Randolph AFB, Texas)

DPMY Lt Col Silva -- Research Division Chief
Lt Col Rider -- Research
Capt Talley -- Research
Maj McIntyre -- Personnel Analysis Division Chief
Lt Dempsey -- Analyst

DPMY Maj Walker -- Financial Management

DPMH Col Barrett -- Director, Personnel Procurement
Col Blair -- Deputy Director
Col Pearis -- Procurement Division Chief
Lt Col Knapp -- Procurement
Lt Col Mosely -- Career Force Management Division Chief
Capt Lucas -- Career Force Management
Capt White -- Career Force Management
Capt Daly -- Career Force Management

DCS/Programs and Resources

PRP Lt Col Reynolds -- Aircraft Allocations
Dr. Simmons -- Aircraft Allocations

PRE Mr. Meredith -- Engineering Programs

PRM M/Gen Posner -- Director of Manpower
Col Fields -- Special Projects & Research
Cpt. Steadman -- Research
Mr. Black -- Manpower Utilization Policy
Lt Col Golder -- Manpower Utilization Policy
Maj Brown -- Manpower Utilization Policy
Maj Dews -- Manpower Utilization Policy
Mr. Greco -- Manpower Utilization Policy

Air Force Systems Command

Headquarters (Andrews AFB, Maryland)

Directorate of Laboratories

E/Gen Hendricks -- Director of Laboratories

Lt Col Ahlborn -- Director of Science

Manpower

Lt Col Cline -- Manpower Analysis

Comptroller

Col Baker -- Comptroller

Operations

Col Barnes -- Development Plans

Air Force Human Resources Laboratory (Brooks AFB, Texas)

Resources

Lt Col Nordhauser -- Assistant to Commander, AFHRL

Sgt Bortner -- Resources

Aeronautical Systems Division (Wright Patterson AFB, Ohio)

Comptroller

Col Zambenini -- Comptroller

Lt Col Johnson -- Cost Analyst

Mr. Gibson -- Life Cycle Costs

Acquisitions Management

Mr. Boykin -- Consultant

F-16 System Program Office

Mr. Wood -- International Economist

Air Force Logistics Command (Wright Patterson AFB, Ohio)

Acquisitions Logistics Division

B/Gen Rutter -- Deputy Commander

Col Pennington -- Analysis

Plans and Programs Directorate

M/Gen Mullins -- Director

Procurement Directorate

B/Gen Kelley -- Director

Operations Directorate

B/Gen Waters -- Director

Air Training Command (Randolph AFB, Texas)

Training Systems Development

Dr. Meyers -- Analyst

Cost and Economic Analysis

Mr. Niblock -- Analyst

Air Force Manpower Engineering Agency (Randolph AFB, Texas)

Col Kitchens -- Manpower Engineering

Capt Coleman -- Manpower Engineering

Mr. Geary -- Manpower Engineering

Sgt Adkins -- Manpower Engineering

APPENDIX B

Problem Statements

I. OUTPUT AND BENEFITS

I-1 Measures of Merit

In deciding (e.g., base closure) how do you measure cost vs. benefits of various choices? What are the opportunity costs in closing bases? How do you measure opportunity cost in the public sector? How can you measure merit in value of new generation of computers?

I-2 Professional Military Education

What are the benefits of professional military education? What are the costs? Is PME cost effective? If so, how should funds be divided among company grade, field grade, and senior ranking officer training programs? Who should go to PME? Is a resident school the most efficient way to provide education? What should the goals be for professional military education?

I-3 Sources of Officers

Air Force officers now can be commissioned through OTS, ROTC, and the Air Force Academy. Which source is the most cost effective? What measures should be used to determine the effectiveness of officers? If one source proves considerably more effective than others, should it be used exclusively? What would be the costs of such a program? Should the Air Force obtain different kinds of officers through different kinds of programs? How should they be allocated?

I-4 Recruiting

What are the factors that motivate a person to enlist in the Air Force? What are the factors motivating high talent individuals to enlist? How effective is Air Force advertising? Is it possible to determine which advertising is most effective? What is the productivity of the recruiter?

Is the recruiter cost effective? Are there alternatives which would be more so?

I-5 Fringe Benefits

Are fringe benefits more cost effective than increases in up-front income? What is the most efficient method of providing medical care to Air Force members and families? Should these services be provided by military personnel or civilian medical personnel? How should the costs and benefits be measured? What about wartime requirements and readiness implications of such choices? Should enlisted personnel eat and sleep in government facilities? What are the costs, benefits and readiness implications? Are commissaries and exchanges cost effective? What is their drain on local economies? Is this an "unfair tax" on competing civilian merchants? What are the retention implications of fringe benefits versus up-front pay?

I-6 Retirement Compensation

How do you compute the value of retirement compensation? What is the value to servicemen of retirement? What is the retention value of future income streams? Should retirement programs be vested at 20 years? Less? More? What are the relative costs and benefits?

I-7 Personnel Productivity

How do you measure the product of various types of workers in the Air Force? Is there a standard for measuring productivities among occupational groups? How should various classes of workers be compensated

for additional productivity. What are the absolute benefits of various forms of training (e.g., simulation, hands-on, computer managed, computer assisted)?

I-8 Measures of Training Output

In using simulation, the closer to actual experience, presumably the better the training. However the more realistic the training, the more the cost. How can you measure the marginal benefit of training as each step of realism is added? Is there a method of optimizing the value per dollar spent to provide the most efficient allocation of funds to training devices?

I-9 Military/Civilian Trade-offs

What should be the trade-off criteria for decision determination between using military and civilian personnel? How do you measure the costs and benefits of using each? What variables should be measured?

I-10 Weapons Capabilities

How can weapons capabilities be measured in order to provide relative comparisons with cost?

I-11 Effectiveness of People Programs

Logistics Command has instituted pilot job enrichment programs. Since LogCom must be ready for surge capabilities as part of its charter, many of the personnel are under-employed in a peacetime environment. The job enrichment programs are designed to keep morale high for these under-employed individuals. How do you evaluate the effectiveness of these programs? What measures can you use when productivity rates are relatively meaningless?

I-12 Value of the Industrial Base

Should additions to the value of the industrial base be included as a benefit of government contracts? If so, to what extent? What kind of applications? How can it be measured?

I-13 Acquisition Investment Mix of Systems

How can you measure the best mix between built-in reliability, automatic test equipment, and built-in test equipment? Which method provides the most cost effective method? How do you measure the costs and the capabilities?

I-14 Research Investment Returns

How can the return of funds invested in research be measured? How long should the time horizon be in such measurement? In comparing laboratories, the AFSC has a system called "investment strategy" in which costs are compared with potential uses of research. How do you measure the value of these uses, since they are obviously different? Is there a system to provide input on potential pay-off?

I-15 Measurement of Savings

Many programs are judged effective if costs are avoided, yet there is no way to measure these costs. How do you show the value of savings? Is it possible to track through the system to see the total effects of a program? How?

I-16 Trend Analysis Criteria Selection

In preparing budget defense, trend analyses are used. How do you determine which independent variables are most important? What criteria

should be used for selections between program budget decision alternatives?

I-17 Benefits of Improved Management

Many management actions result in intangibles--there is no specific dollar "savings" readily apparent. How can the value of the benefits of such improved management be measured? What variables should be investigated?

I-18 Construction Requirements

With limited funds, planners of construction budgets must make decisions between very unlike projects. For example, they might be faced with the decision of building a chapel at Wright Patterson AFB as opposed to a gymnasium at Williams AFB. Is it possible to design some measure of the "output" of facilities provided for human enrichment? Are such decisions quantifiable?

I-19 Game Theory

What applications are there for game theory in choices between alternative AF programs?

I-20 Discounting

What is the proper discount rate when there is no real opportunity cost? Is it proper to discount government purchases of long-life items--does the government have an alternative which pays interest? Are there different rates which are applicable?

I-21 Cost Effectiveness of Computers

Computers seem to generate excess products which need analysis and

people to operate them. Are all the costs of computers included? What should be included? What are the net benefits? How do you measure whether or not a computer is necessary?

I-22 Investment in Human Capital

How long must individuals serve in order to justify training in all the various specialties? Is there some common measure or benefit which would allow such computation? Could common factors be derived? How long must a pilot serve in a pilot capacity to justify training? How do you include a readiness factor for pilots in non-flying jobs?

I-23 Programmed Depot Maintenance (PDM) Contractor Performance

How do you measure PDM contractor performance? What types of incentives would be effective for assuring quality maintenance through service contracts?

I-24 Effectiveness of Logistics Systems

What should be the measures of merit of logistics systems? What should be the criteria for judging the performance of the system? What weight should be placed on each criterion?

I-25 Small Business Requirements

Are current requirements to use small businesses cost effective? What are the costs? What are the benefits? Is either measurable? If so how?

I-26 Federal Productivity Measurement Program

There is a current system of manpower productivity measurement which is imposed on the services by direction from OMB. Does this system truly measure productivity? Are there better alternatives?

I-27 Grade Comparability

There are continued requirements to compare civilian and military grades, yet there is no real way to make comparisons. Is it possible to determine comparable outputs and capability requirements? How should they be measured? What are comparable grades?

I-28 Value of the Civil Service

The civil service worker provides continuity, stability, and corporate memory to the military. But in deciding whether to use contractors or civil servants, these benefits are not explicitly included. What is the value of a civil service? What benefits do they provide? When deciding between using civil servants or contractors, how should these factors be considered? Is it possible to make the civil service more competitive with civilian contractors on a visible cost basis?

I-29 Women in the Air Force

The Air Force is committed to increased use of women. Are there significant differences in the productivity of women vis-a-vis men? What impact do women have on readiness? Current manhour availability factors are based on experience with men. Are there differences between men and women in terms of actual time available for work? Are there implications for the future man/women force mix?

II COSTS

II-1 Costs of Errors in Job Analysis

What are the total costs involved in errors in task analysis? How do you measure down-stream pyramiding costs? What effects do such errors have on misallocation of personnel, training facilities and time?

II-2 Costs of One-year Planning

How much cost is involved in planning on a one-year basis? Is there any way to avoid unnecessary costs given the current political requirements? Could there be a method to present the issue to Congress which would be convincing?

II-3 Life Cycle Costing Methodology

Is the concept of life-cycle costing really feasible? What parts are pertinent to figuring life-cycle costs? What is the time sequence in which the various cost generators should be brought into the equation? How do you predict what a new weapons system will cost? Are there certain predictable ranges of potential trade-offs which could be included in the equation (e.g., B-52 conventional role which was not anticipated when the system was acquired)?

II-4 Life-cycle Costing of Personnel

How do you compute life-cycle cost of personnel including training, compensation, upkeep and retirement?

II-5 Capital Labor Trade-offs

How much can the up-front capital costs be increased to lower life-cycle downstream labor costs? Can built-in reliability factors lower life-cycle costs appreciably? How much?

II-6 Design to Cost

Current design to cost considerations are based on acquisition cost.

Is it possible to design to life-cycle cost? How could this be done?

What information would be necessary in order to make such designs?

II-7 Total Costing

What should be included in costs in comparing various programs? In charging foreign governments for U.S. training, which costs should be included? How can marginal costs be computed? Should sunk costs be considered?

II-8 Logistics Back-up for Training Devices

What is the cost of logistics back-up for training devices? What are the relative merits of simulators, computer training, etc.?

II-9 Cost Savings in Decreased Training Time

How do you measure total costs saved by decreased training time? What are the costs of unnecessary training? What is unnecessary?

II-10 Offsets

How should offset percentages be computed for sales of U.S. products manufactured in foreign countries? Do prices NATO allies pay reflect costs or is part a contribution? How much of total weapons cost should be born by foreign governments?

II-11 Long-run Costs of Training Decisions

How do you measure long term costs of alternative training decisions?

What are today's costs versus 10 years from now?

II-12 Marginal-cost of Training Programs

How do you compute marginal costs of training? Do these costs have bearing on various alternative training choices? What should be included in costs?

II-13 OJT

How do you measure the total cost of on-the-job training? Can this affect the student-instructor ratio? How do you measure the cost of OJT instructors? What are the relative merits and costs of hands-on vs. formal training? What are relative costs of training from scratch versus transfer and OJT on new weapons systems?

II-14 Terms of Enlistment

Are there advantages to varying the terms of enlistment? Are there additional costs in such a program? What is the most cost effective term or would it be more cost effective to have varying terms and/or indefinite terms?

II-15 Allocating Costs Among Weapons Systems

Many Air Force organizations service different weapons systems. To account for funds spent on various systems and programs it becomes necessary to allocate funds expended by these agencies. What is the best way of allocating such funds when it is impossible to identify actions with programs or systems?

II-16 Military Specifications

Are military purchases over-specified? How can you tell? How much does overspecifying cost? Is it possible to tailor the application

of military specifications and what would be the costs involved?
Does the military understand what civilian off-the-shelf items are available or do military specs hide such availability? What incentives are there to not over-specify? Could such incentives be derived?

II-17 Commonality

What are the excess costs versus the benefits of commonality? This could be extended from very small items to weapons systems (e.g., F-111).

II-18 Statistical Pricing

Currently, small orders are priced statistically based on historical information, rather than by bid. What is the most efficient way to price small orders? Is statistical pricing the cheapest? Is the current system fair to both the small contractor and the Air Force?

II-19 Man-hour Cost Accounting

Current man-hour cost accounting is computerized, extensive, and very expensive. It acts as the basis for setting standards. Is the measurement system necessary? Could other systems be used which would provide the same data at lower cost? What systems?

II-20 Eroding "Lower Level" Industrial Base

There is a current apparent excess capacity in prime contractors for the Air Force (e.g. Boeing, McDonnell-Douglas, etc.), but perhaps a shortage in sub-contractors. Have past pricing practices indeed decreased this lower level industrial base? If the base is shrinking, how can it be prevented? Should the Air Force give excess payments to preserve this base? How much?

II-21 Cost Estimating Techniques

Cost estimates are made annually and for the whole period of a program. Currently the estimates are made in the same manner, but they are not the same. What connection is there between the two and is there a better method of estimating both?

II-22 Costs of Few Sellers

For certain products bought by the Air Force, there are very limited numbers of contractors available. What is the cost of this oligopoly situation? Is there any cure? If so what?

II-23 Government Mandated Price Increases

In certain instances, the government, through contracting arrangements, is itself responsible for price increases. What is the cause of the phenomenon? Is it necessary? Can it be avoided? Should it be avoided?

II-24 Costs of Non-procurement of weapons systems

Once a program has begun, what is the cost of not procuring a weapon system? Presumably the money not spent on one project could be spent on another (or not spent at all), but this does not account for the costs of not producing which eventually the Air Force must pay, e.g., if the B-1 is not procured, Rockwell will incur costs to hold on to engineers. The Air Force will pay this cost on future projects.

II-25 In-house Versus Contractor Choices

How do you measure the costs and benefits of choosing between using a contractor and using in-house resources? Are there costs involved in switching back and forth?

II-26 Costs of Stretched Programs

What are the total costs of stretching programs? What price must be paid for flexibility? What are the costs of lack of flexibility?

III. AF/CONTRACTOR RELATIONSHIPS

III-1 Procurement Strategies

What is the most efficient strategy of procurement of weapons and other items? Should procurement be from single firms for design, management, and production, or should separate firms perform functions? How could relative merits of strategies be measured?

III-2 Contractor-military Relationships

What determines "proper" military contractor relationships? Which restrictions aid and which detract from benefitting government in contract negotiations? What standards should there be for foreign military sales?

III-3 Contractor Performance Measurement

Because of inflation, contractors cannot afford to enter into fixed cost contracts. Currently, there is a system to evaluate the efficiency of contractors and thus to determine if the prices charged are justifiable. Is such a program needed? If the incentive of profit is sufficient, then costs of a program to evaluate contractors may be unnecessary. On the other hand, if such a program is necessary, how do you best determine contractor efficiency? Current programs measure cost and time schedule compliance but ignore technical achievement. How do you measure technical achievement?

III-4 Business Ethics

The Air Force will continue to do increasing amounts of business with foreign countries and firms. What effects do foreign ethics which are culturally different than ours have on our business ethics? Can we predict the effects on the U.S. business community? Will it cause any change between the Air Force and U.S. internal contractors?

III-5 Contractor Maintenance on New Systems

Is interim contractor maintenance support, as opposed to Air Force maintenance, on new systems more cost effective? How long should such support be contracted for? How can the optimum time period be determined?

III-6 Buying-in

Some contractors may practice the concept of buying-in (i.e., knowingly bidding less than it will cost them to provide the contract services with the hope of future contracts on the basis of performance on the one on which they bid). Is there anything wrong with this? Is it counterproductive? How much does it cost the Air Force in the long run? Are there benefits of such practices? How can escalating costs be avoided once a lock-in has occurred?

III-7 Contractor Incentives to Over-complicate

Currently there is a "value-engineering" program which gives contractors a motive to simplify their existing designs. Is this a negative incentive to contractors to over-complicate original designs so that they might later be profitably simplified?

III-8 Contractor Incentives to Minimize Costs

Most contractors operate on a cost-plus basis. Since their incentives are presumably to maximize profits, what incentives are there to keep the costs down? What kind of incentives could be devised?

III-9 Effectiveness of Contractor Incentives

Current incentives are based on the supposition of profit maximizing firms. Do these firms indeed profit maximize? If not, are the

incentives based on profit maximization effective? What other incentives could be used? Are firms constrained by short-run profit maximization?

III-10 Reliability Improvement Warranty

A current program which was just initiated requires contractors to provide a warranty and pays a premium for the additional reliability. If the system breaks down, the contractor warrants that he will fix it. How should you price such a warranty? How do you balance the risk between industry and the government? How do you measure the effectiveness of a reliability improvement warranty system?

III-11 Effects of Unions on Contractors

What effect do union contracts with defense contractors have on contract overruns? Are lock-in aspects of government contracts fair to contractors faced with union escalators? Could such effects be predicted? Could compensations be written in to government procurement contracts?

IV. MANAGEMENT

IV-1 Incentives

Many current formal and informal incentives within the Air Force run counter to established policies. Is it possible to identify these perverse incentives? Once they are identified, is it possible to measure the cost of maintaining the incentives versus the benefit to be obtained by changing policies? What are optimum incentive policies?

IV-2 Building Cost Consciousness Into System Design

What motivations could be given to convince engineers to provide low-cost programs? Since performance requirements get locked in early in program development, before design and cost implications become apparent, how do you anticipate these cost factors early enough to affect performance requirements?

IV-3 Incentive Systems For Managers

What is the most efficient method of providing incentives to managers to operate at least cost? How do you get managers to operate as "profit maximizers" with no profit? How do you get managers to get over the "not on my watch" syndrome?

IV-4 Worker Motivation

How do you keep the worker who changes black boxes motivated?

IV-5 Maintenance Man-hour Standards

Current standards for manning are based on historical experience concerning how long it takes to do a given job. However, this process can be a self-fulfilling prophecy since if people work more slowly than they could, through poor scheduling etc., the standards will be

established based on these lower rates. What are the best methods to set realistic standards?

IV-6 Management Structures

Are there alternatives to pyramidal management structures? What applicability do they have at various levels of management? What are the costs/benefits of alternatives? Can they be measured? How?

IV-7 Organizational Development

Traditionally the Air Force has operated with a pyramidal organization. Recently ASD has adopted a matrix organization. What is the best way to transition from one organizational structure to another? How can the transition be accomplished in a manner which not only makes people comfortable with the new lines of communication, but makes them more effective as well?

IV-8 Administration

What is necessary administrative and clerical work? Are all the files which are kept cost effective? How can the costs and benefits of administrative personnel be measured?

IV-9 Financial/Statistical Reporting

What is the least cost method of disseminating statistics to Air Force components? Full reporting? Reporting by exception? What are the methods to measure relative costs/benefits? What are advantages of localized, regionalized and national data base maintenance and reporting.

IV-10 Air Force Accounting Systems

Should the Air Force have a cost accounting system? What are the costs

of such a system? What functions does it perform--how do you judge the benefits? What are information costs?

IV-11 Audit Requirements

How much auditing is enough? Does the value justify the cost? Is the current philosophy "more is better?"

IV-12 Evaluation of Current Air Force Economic Analysis Program

The Air Force currently has a program designed to build economic analysis into all decisions processes. Is it working? How effective is it? What improvements could be made in the program? Do decision makers use the analysis? If not, why not? How could this be improved? What is the quality of the analysis? Would creation of a separate economic analysis agency for the Air Force be cost effective?

IV-13 Program Evaluation

What is the best way to evaluate on-going military programs? How can interactions of programs be included in program evaluations?

IV-14 Management Improvement Suggestions

With a pyramidal organization ideas and techniques tend to flow from the top to the bottom, even though the day to day contact with problems is at the lower levels of organization. How do you insure that the flow of information from the bottom to the top exists and expands? How much should lower level workers participate in management decision processes? How can the flow of information between OSD and the services be improved?

IV-15 Utilization of Lessons Learned

How do you insure that lessons learned in design as well as management of one system are transferred to future systems? What kind of information system could be developed which would avoid repetition of mistakes?

IV-16 Communication of Economic Choices to Top Managers

Basic economic choices are made by top leaders (generals). What is the best way to portray the alternatives to economically uneducated managers and still preserve the essence of the economic factors involved? Could generals be educated? What would the cost be? Would it be worth it? Are there alternatives?

IV-17 Information Retrieval

The Air Force currently does not really know what things cost, particularly operations and support costs. One major problem is in retrieval of information. What is the best method of acquiring, storing, and retrieving information? What quality can be given up to save cost of such a system?

IV-18 Generalist vs. Specialist

The current career progression program for officers is based on the concept of the generalist. "Every man can become chief of staff." What are the costs and benefits of such a philosophy? What variables should be included in such an analysis? What is the value of intensive experience relative to extensive experience?

IV-19 Promotion Systems

The current promotion system is an "up-or-out" system. What are the

costs of such a system? Do the benefits outweigh the costs? What are alternative promotion systems? What would be the costs and benefits?

IV-20 Demography

What is the manpower pool? What skills are available and where? In which market can specific types of officer candidates be found?

IV-21 Retention

What are the major factors which motivate people to stay in the Air Force? Are the factors different for high talent people? What is the value of meeting personal desires about assignment, in retention? What value do fringe benefits impart? Are these factors quantifiable in a common unit of measure?

IV-22 Improvement of pay systems

What incentives are necessary to insure proper skill mix? Can extra compensation provide scarce skills? How much? Can this be measured? What are equity considerations in providing skill pay? Are there costs?

IV-23 Management Manpower Requirements

How do you determine how many managers are optimal? What relation does this have to organizational structure? Are there structures which could do the job but with less manpower tied up in management?

IV-24 Depreciation

Should Air Force assets be depreciated? How? Should depreciation be based on acquisition cost or replacement value? Since industry depreciation theory is based on tax structure, can it be adapted to non-tax paying government usage?

IV-25 Industrial Funding

What types of activities could be profitably industrial funded without affecting mission accomplishments? What kinds of safeguards could be necessary? What kinds of incentive structure could have to be built into such programs?

IV-26 Compartmentation of Funds

Are there costs to compartmenting funds at operating levels? How can they be computed, (e.g., different accounts for TDY, pay, operation, etc.)?

IV-27 Allocation of Spare Parts Funds

What criteria should be used to allocate funds among various categories of spare parts? Between weapons systems? (Currently using backorders-- would it be better to use NORS, or some other criterion?)

IV-28 Industrial Stock Fund Pricing

What types of accounting systems should be used in stock-fund pricing to assure that funds are not depleted prematurely? FIFO or LIFO etc.? How should catalogues be updated to avoid lags in pricing?

IV-29 Asset Valuation

How can current Air Force assets be valued? Is there benefit to balance sheet analysis for the Air Force?

IV-30 Differentiation Between Productivity and Inflation

Many union contracts with defense contractors include bonuses for productivity increases. How do you differentiate between real productivity

increases and inflationary increases? How do you avoid double counting of inflationary factors in computing payments on cost-plus contracts?

IV-31 Readiness

How do you build the concept of readiness into logistic considerations when the primary motives are for low cost? How do you split up work done at depot level and locally from both a cost point of view and a readiness point of view? How do you quantify readiness?

IV-32 Time Involved in Budgeting Cycle

The present PPB cycle is a cumbersome and time-consuming process. Often, due to the time involved, programs are overtaken by events. What is the best way to reduce the time involved? Is the PPB system as it now exists most efficient? What improvements could be made?

IV-33 Capital-labor Trade-offs

Are there methods to measure the value of capital replacement of labor? What are relative costs and benefits of "throw-away" versus "repair" maintenance programs?

IV-34 Philosophy of Manpower

Current manpower philosophy is based on the assumption that everything which relates to combat or combat support should be done by military personnel and all other things by civilians. Is this indeed consistent with national policy? Is it consistent with current military requirements? Does the increasing economic squeeze on budgets militate for a change in this basic philosophy? Should civilians be performing more "military" duties?

IV-35 Value of Free Overtime

Most military members consistently work overtime with no pay. Manpower allocations are made based on a recognition that this overtime is consistently worked. What is the value of this "free" overtime? Are there hidden costs in requiring military members to work overtime without pay? Are there benefits to members (e.g., overseas where workers would rather work than be idle)? Should manpower allocations be based on an overtime factor?

IV-36 Headquarters Productivity

Over the last several years there has been continual pressure to decrease the number of people in headquarters. Have their cuts caused a deterioration in management provided by the headquarters? Are managers spread to thin? Are they trying to over-manage? Are there organizational changes which could be made which would provide better management with fewer people? What is an optimal headquarters manpower level?

V. FORECASTING AND PROJECTION

V-1 Budget Macro Estimates

How do you predict budget levels for future planning of programs? For weapons? What effect does this have on R & D? How can you predict out-year R & D budget figures?

V-2 Economic Cycles and Enlistment

Historically there has been an inverse relationship between the business cycle and military recruiting (i.e., when the economy is on the upswing, recruiting becomes more difficult and vice versa). Is it possible to predict the business cycle in order to make recruiting plans? Are there alternatives which would provide the necessary information without relying on economic cycles? What are they and how could they be captured? Is it possible to predict with accuracy the supply of enlistees?

V-3 Force Projections

Many Air Force programs which affect people are long lead-time programs (e.g., medical personnel and facilities). Is there some way in which future demand for personnel could be projected? What variables could be used? Are they measurable? How accurate have previous projections been and in the case of error, what was the problem? Could it be corrected in future projections? How could personnel planning factors be included in weapons systems decisions?

V-4 Manpower Modeling

Current manpower models are cumbersome and subjective. What variables should be used to predict manpower requirements? Are there special variables for special types of manpower (e.g., scientific and technical, pilots, R & D) or are generalized variables available? Which variables

should be included? Is there a method of objectively measuring research manpower requirements?

V-5 Expenditure Forecasting Model

There are time lags between initiation and commitment to programs and obligation of funds. There are additional lags between obligation and actual expenditures. It is essential for proper budget management to know the length of these lags, but there is currently no method of predicting the lag. Could such a prediction model be built? What would be the variables?

V-6 Price-escalation Indices

Current estimates of price escalation are achieved at a micro level measuring historical data on labor, materials, and overhead as related specifically to airframe, avionics, and engines for each type of aircraft and manufacturer. The weighting of such measures is subjective. Is there a better method of weighting? What errors are built into the present system and how large are they? Could a better index be obtained by using some gross index? Predicted future rates are only good for two years and after that a flat 4% is used. Is there a better method?

V-7 Surge Capacity of the Industrial Base

How much surge capacity is necessary for the military/industrial base in the context of the present military situation? Is such a capacity available? Where are the weaknesses? How could they be overcome?

V-8 Life-cycle Cost Goals

Life-cycle cost goals are historically based. Is there a method which

would allow you to predict future technologies which would allow more realistic goals? How could this be done?

V-9 Identification of Operational Requirements

How can operators do a better job of defining Required Operational Capabilities (ROC)? What method should be used to incorporate cost/performance trade-offs into the ROC? How can logistic considerations be included in ROCs?

V-10 Aircraft Attrition

Requirements for aircraft are partially based on models predicting accident rates. These models tend to be rather simplistic and do not predict very well. One of the major factors leading to this error is the introduction of new aircraft which are unlike existing aircraft on which the model is based. Is there a better way to predict aircraft accidents? Is there a way to include the effects of new, untested aircraft? What variable should be included in such a model?

V-11 Logistics Estimates of Requirements

How is the best way to estimate monetary requirements for the logistics necessary for future weapons systems? How are long lead-time requirements estimated?

V-12 Parts and Maintenance Requirements

How can we project requirements for parts and maintenance? Currently there is a discussion as to whether to use hours flown or sorties. Are either of these the best? Are there others which might be better?

V-13 Resource Priorities for Surge Requirements

How do you establish priorities for resources to meet surge requirements?
What criteria do you use to determine these priorities? How can you optimize given the existing budget constraints?

V-14 Forecasting Civilian Job Prospects

One of the major factors determining retention of both officers and enlisted men is the civilian job alternatives. Job availability also affects recruiting. Is it possible to predict the future civilian job market in specific professions and skills? How detailed should such a projection be? What would be the variables?

V-15 Foreign Contractors

What is the effect of European contractors on future logistic backup for new systems which are jointly produced by NATO allies? What effects do the economic and political factors present in these countries have? What kinds of trade-offs are necessary?

V-16 Foreign Military Sales Effects on Logistics

What are the effects of expanded foreign military sales on future U.S. logistics requirements? Is there a necessity to protect future U.S. logistics support by curtailing over-commitment of contractors to foreign requests?

V-17 International Contracts

What are the effects of foreign inflation rates which are different from U.S. rates on international contracts? Can rates be predicted?

V-18 Currency Flow

The production of the F-16 will be carried out by five different countries producing different parts. What effect will changing currency flows have on contractual agreements, budgetary planning, etc.? Is it possible to predict currency exchange rate fluctuations? How can problems caused by fluctuations be overcome?

V-19 U.S. Effects on Foreign Economy

What are the macro-economic effects of U.S. spending in foreign countries? Multiplier? Should there be quid pro quo? How could this be computed?

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Interviews were conducted with Air Force decision-makers and analysts of all ranks and from all levels of organization. The purpose was to ascertain the basic research needs of the Air Force in the fields of economics and management. Over one hundred separate research requirements were identified. The gaps in knowledge which were most often mentioned were in measurement output so as to determine effectiveness of programs, in measuring costs, in determining the most effective management techniques and motivations, in determining proper variables on which to (Cont'd on reverse)		

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make projections, and in selecting criteria by which to judge programs. A number of questions posed appear answerable by the research community.



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